Predicted 2005 Recreational Landings for Gulf of Mexico Red Grouper
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Southeast Regional Office
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Background

The Gulf of Mexico Fishery Management Council (Council) is currently developing a Regulatory Amendment to the Reef Fish Fishery Management Plan (GMFMC 2005). The regulatory amendment includes management alternatives for reducing the recreational harvest of red grouper, and possibly other grouper. Reductions in red grouper harvest are needed because landings exceeded the 1.25 mp gutted weight (mp GW) recreational target catch level during both 2003 and 2004. In 2003, recreational anglers landed 1.35 mp GW of red grouper. In 2004, recreational anglers landed an estimated 3.18 mp GW of red grouper.

During public hearings in June 2005 to discuss interim recreational regulations for red grouper, many anglers stated 2004 Marine Recreational Fisheries Statistics Survey (MRFSS) landings were an anomaly and interim regulations were not required. Anglers also indicated preliminary landings in 2005 were well below landings during comparable time periods in 2004, and therefore interim regulations were not required.

The intent of this report is to predict 2005 red grouper landings (without accounting for reductions resulting from interim regulations) and determine if these landings are consistent with the reductions being considered in the Red Grouper Regulatory Amendment (GMFMC 2005) This report predicts 2005 red grouper landings using preliminary MRFSS waves 1-3 red grouper landings and historical MRFSS and Southeast Fisheries Science Center (SEFSC) headboat landings data (1995-2004 and 2000-2004).

Methods

Landings data by wave were obtained from the MRFSS and SEFSC's headboat survey for the years 1995-2004. Landings were converted from pounds whole weight (WW) to pounds GW using the equation: lbs(GW) = lbs(WW)/1.048 (Goodyear and Schirripa 1993). Red grouper landings were summed for MRFSS waves 1-3, and for all waves to provide an estimate of MRFSS annual landings. Linear, second-order polynomial, and exponential regressions were fit two time series of landings data (1995-2004, 2000-2004). The longer time series (1995-2004) includes charterboat landings collected using two different sampling and estimation methods. MRFSS change the methods for estimating charterboat landings beginning in 2000.

Red grouper landings for waves 1-3 were used as the independent variable for each regression and MRFSS annual landings were used as the dependent variable. Correlation coefficients (r^2) were summarized for each regression to determine how well wave 1-3 red grouper landings predict annual red grouper landings. Ninety-five percent confidence limits for the mean were computed using SAS software (version 8.0). Annual 2005 red grouper MRFSS landings were

predicted using the regression equations described above and preliminary 2005 MRFSS landings for waves 1-3. Predicted red grouper headboat landings for 2005 were calculated by multiplying the estimated 2005 MRFSS landings from each of the regressions by 0.0377 (the average percentage of recreational red grouper harvest accounted for by headboats during 2003-2004).

Results

Table 1 summarizes red grouper MRFSS landings for waves 1-3, annual MRFSS landings (1995-2005), and annual headboat landings (1995-2004). Since 1995, red grouper MRFSS landings for waves 1-3 have ranged from a minimum of 133,871 lbs GW in 1996 to a maximum of 1,589,065 lbs GW in 2004. Preliminary 2005 MRFSS landings for waves 1-3 are 904,421 lbs GW, or approximately 43 percent less than 2004 landings. However, these landings are greater than average wave 1-3 MRFSS landings observed during 2001-2003 (518,756 lbs GW). Annual MRFSS landings have ranged from a minimum of 593,929 lbs GW in 1997 to a maximum of 3.065 mp GW in 2004, while annual headboat landings have ranged from 38,687 to 119,558 lbs GW during this same time period.

Figure 1 and Table 2 summarize the results of each of the regressions. There was a strong correlation (>0.85 r^2) between MRFSS wave 1-3 landings and annual MRFSS landings for all the regression models. The polynomial and exponential regression models incorporating the shortest time series (2000-2004) had the best fit (0.91-0.97 r^2). However, the 2000-2004 polynomial regression model appears unrealistic when compared to longer time series, because it predicts lower annual landings for intermediate MRFSS wave 1-3 landings (Figure 1).

Predicted 2005 red grouper MRFSS landings ranged from a minimum of 1.53 mp GW to a maximum of 1.98 mp GW. If the 2000-2004 polynomial regression model is excluded, predicted 2005 MRFSS landings range from 1.83 to 1.98 mp GW. Predicted 2005 headboat landings ranged from 60,076 to 77,639 lbs GW. Total annual recreational red grouper landings for 2005 were predicted to range from a minimum of 1.59 mp GW to a maximum of 2.06 mp GW.

Based on the range of predicted 2005 landings summarized in Table 2, it is estimated that a 21.5 to 39.3 percent reduction in harvest would be needed to eliminate recreational overages in 2006. If predicted landings for the 2000-2004 polynomial regression are excluded, reductions in harvest would range from 34.5 to 39.3 percent. Ninety-five percent confidence limits summarized in Figures 1 and 2 indicate predicted landings could be significantly higher or lower, however, with the exception of predicted landings from the 2000-2004 polynomial regression model, all lower 95 percent confidence limits are above the 1.25 mp recreational red grouper target catch level.

Discussion

All of the linear and polynomial regressions provided a strong relationship between MRFSS waves 1-3 landings and annual landings, indicating MRFSS wave 1-3 landings are a good predictor of annual MRFSS red grouper landings. Predicted 2005 landings (headboat + MRFSS) are expected to range from 1.59 to 2.06 mp GW (1.90 and 2.06 if the 2000-2004 polynomial regression is excluded), and therefore have a high likelihood of exceeding the 1.25 mp GW

recreational target catch level. Reductions in harvest estimated using 2005 predicted landings are consistent with reductions being considered in the Council's Regulatory Amendment (GMFMC 2005) and therefore the reductions appear appropriate for eliminating recreational overages and returning red grouper landings to levels specified in the rebuilding plan (NMFS 2004).

Predicted landings summarized in this report should be used with caution and should not be used as the basis for reductions in harvest. Predicted landings could be higher or lower than estimated, as evidenced by confidence limits plotted in Figures 1 and 2. Additionally, predicted landings purposefully do not account for reductions in harvest resulting from interim regulations implemented in August 2005 (NMFS 2005), and therefore likely overestimate annual landings for 2005.

References

Goodyear, C.P. and M.J. Schirripa. 1993. The red grouper fishery of the Gulf of Mexico. NMFS, SEFSC, Miami, FL. MIA-92/93-75. 122 p.

GMFMC. 2005. Draft regulatory amendment to the Reef Fish Fishery Management Plan to set red grouper total allowable catch and shallow-water grouper management measures for the 2006-2008 seasons. GMFMC, Tampa, FL.

NMFS. 2004. Secretarial Amendment 1 to the Reef Fish Fishery Management Plan to set a 10-year rebuilding plan for red grouper, with associated impacts on gag and other groupers. NMFS, Southeast Regional Office, St. Petersburg, FL. 262 pp.

NMFS. 2005. Environmental Assessment for an interim rule to reduce recreational red grouper harvest in the Gulf of Mexico, with associated impacts on gag and other grouper. 92 p.

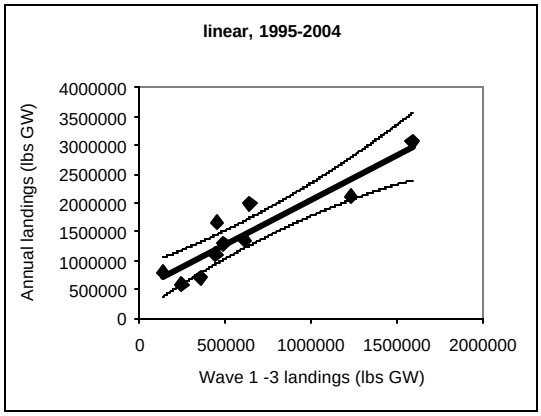
Table 1. MRFSS and headboat landings (lbs GW) for Gulf of Mexico red grouper, 1995-2005. MRFSS landings for 2005 are preliminary. N/A indicates landings are not available

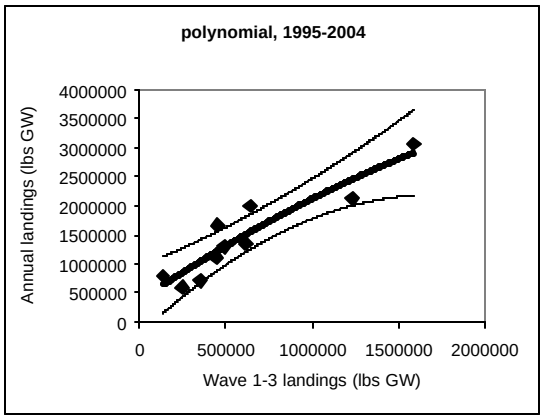
	Landings (lbs GW)			
Year	MRFSS Waves 1-3	MRFSS Annual	HB Annual	MRFSS + HB Annual
1995	640,028	1,996,976	107,544	2,104,520
1996	133,871	795,211	103,836	899,047
1997	247,164	593,929	49,117	643,047
1998	352,623	709,551	56,227	765,778
1999	444,769	1,112,719	61,006	1,173,725
2000	1,234,813	2,122,908	66,948	2,189,856
2001	614,639	1,350,482	48,980	1,399,462
2002	450,418	1,664,292	38,687	1,702,979
2003	491,211	1,296,769	51,170	1,347,939
2004	1,589,065	3,065,705	119,558	3,185,263
2005	904,421	N/A	N/A	N/A

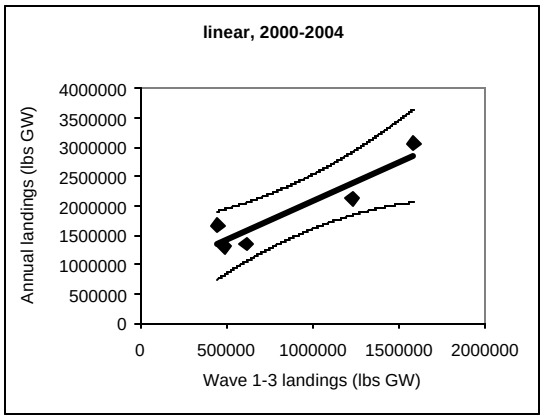
Table 2. Summary of linear, polynomial, and exponential regressions used to predict 2005 MRFSS red grouper landings. y = annual MRFSS landings, x = MRFSS waves 1-3 landings, r^2 = correlation coefficient. Headboat landings were estimated by multiplying estimated MRFSS landings by 0.0377.

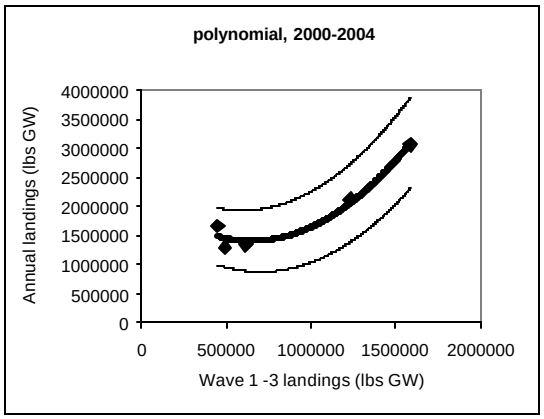
Type of Equation	MRFSS Time Series	Formula for Estimating MRFSS Landings	r^2	2005 Estimated Landings (lbs GW)		
				MRFSS	HB	Total
Linear	1995-2004	$y = 1.559x + 504573$	0.85	1,914,475	75,003	1,989,478
Linear	2000-2004	$y = 1.341x + 725509$	0.87	1,938,066	75,928	2,013,994
Polynomial	1995-2004	$y = -3E\text{-}07x^2 + 2.005x + 372522$	0.85	1,981,744	77,639	2,059,383
Polynomial	2000-2004	$y = 2E\text{-}06x^2 - 2.461x + 2202094$	0.97	1,533,452	60,076	1,593,528
Exponential	2000-2004	$y = 979707e^{6.943E-07x}$	0.91	1,835,722	71,918	1,907,640

Figure 1. Linear and polynomial regressions used to predict 2005 annual MRFSS landings. The relationship between wave 1-3 MRFSS red grouper landings and annual MRFSS landings was regressed to predict 2005 annual landings. Preliminary wave 1-3 red grouper landings are currently unknown.









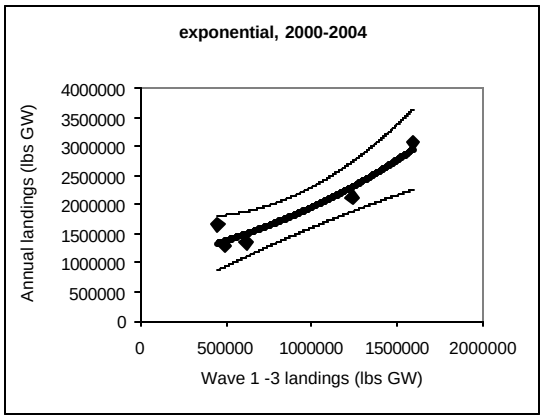


Figure 2. Mean predicted 2005 red grouper MRFSS landings (± 95 percent confidence limits). The dashed line represents the 1.25 mp recreational target catch level.